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COMMON SYSTEMS
48 CHANNEL PCM BANK TYPE D4
APPLICATION SCHEMATIC

CHANGES

B. Changes in Apparatus

B.1 Added

1 - Message Register MR - FS 7 and APP Fig. 12 15D

1 - Diode CR1 - FS 7 and APP Fig. 12 456F

D. Description of Changes

D.01 APP Fig. 12 was added for FS 7.

D.02 In CAD 27, reference to Equipment Note 236 was added.

D.03 In CAD 33, cable shield symbols were added.

D.04 In CAD 37, added terminal G10 and connections to it (option V), and added cable shield symbol.

D.05 CADs 55 and 56 were added.

D.06 Circuit Note 119 was added.

D.07 Equipment Notes 235 and 236 were added.

D.08 Circuit Notes 101 and 103 were revised.

D.09 Sheet index was revised to add titles to CAD figures.

D.10 Information Note 302 was added.

D.11 In FS 1, connecting information DDS APPL SCHEM OR AS REQ'D was added.

D.12 In CAD 27, connecting information DDS APPL SCHEM OR AS REQ'D was added.

F. Changes in Description of Operation

F.1 In SECTION III - Part 4, add:

4.41 D4 Channel Bank - No. 3 ESS Direct Interface Channel Unit - SD-3C328-01

4.42 No. 3 ESS Junction Unit Circuit - SD-3H200.

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The 48-channel pulse code modulated (PCM) bank, type D4, is a carrier terminal for processing one to forty-eight 2-way voice frequency (VF) signals using time-division techniques for application to digital transmission facilities.

1.02 The D4 bank consists of two digroups (24 channels per digroup) which can be operated in one of three modes. Mode 1 multiplexes up to 48 VF trunk circuits into a single 3.152-Mb/s bitstream for application to a T1C line where D4 banks terminate each end of the system. Mode 2 multiplexes up to 48 VF signals into a single 3.152-Mb/s bitstream for application to a T1C line which terminates in an M1C multiplexer at the other end of the system. Mode 3 multiplexes up to 48 VF signals into two separate digroups of 24 channels each (1.544-Mb/s) for application to two T1 lines, the other ends of which terminate in D1D, D2, D3, or D4 banks.

SECTION II - DETAILED DESCRIPTION

1. GENERAL

1.01 The function of the D4 Bank is to translate analog voiceband signals to and from PCM signals for transmission over T1C or T1 line facilities. The D4 Channel units convert the incoming VF signals to pulse amplitude modulation (PAM) samples. The PAM pulses from up to 24 channel units are encoded in the transmit unit to form the PCM signal. The PCM signal is processed in the line interface unit for application to the digital line. The receiving unit performs the complementary decoding function.

1.02 In addition to VF processing, circuits are provided for the transmission of per-channel signaling and supervisory information. This information is transmitted during only one of each six successive framing intervals.

1.03 The alarm control unit monitors bank functions and provides alarms and, when appropriate, initiates trunk processing through the trunk processing unit and channel units to properly condition connecting trunk circuits.

2. CHANNEL UNITS

2.01 Several types of channel unit designs are available for specific 2- or 4-wire applications. The 2-wire unit types include dial pulse units (DPO, DPMO, SDPO, and DPT), foreign exchange units (FXO, FXS); E and M units (2E&M, 2E&M6); electronic switching system units (ESP2O, ESP2T); and transmission only units (2TO). The four-wire types include the 4-wire E and M (4E&M,4E&MER); pulse link repeater (PLR); foreign exchange units (4FXO,4FXS); four-wire tandem (4TDM); and transmission only (4TO). Channel unit types may be mixed within a channel bank.

2.02 The channel unit provides the interface between the office VF trunk circuits (or special circuits) and the common equipment units. Each channel unit includes transmitting and receiving VF circuits and signaling and supervisory circuits. In the transmitting circuit, outgoing VF information is sampled at an 8-kHz rate, providing PAM signals which are fed to the transmit unit. Also, outgoing per-channel signaling information is separately supplied to the transmit unit for periodic multiplexing with the voice samples. On the receiving side of the channel unit, the PAM signals are accepted from the receive unit and converted back to VF. In addition, signaling information from the receive unit is demultiplexed and converted to signaling and supervisory information for connection to the VF trunk.

2.03 Transmission or signaling measurements can be made using patch cords designed especially for that purpose via jack access on the face of each channel unit.

3. TRANSMIT UNIT

3.01 The transmit unit encodes the PAM signal from each of up to 24 channels and combines the PCM words with framing pulses and signaling information.

4. LINE INTERFACE UNIT

4.01 The line interface unit (LIU), which includes signal processing for both the transmit and receive sections of each digroup, converts the unipolar bitstream from the transmit unit to a bipolar bitstream for application to the digital line. This unit also contains the transmit clock and receiving converter circuitry.

4.02 There are three types of line interface units for the three operational modes (1.02) of the D4 bank. LIU1, LIU2, and LIU3 are used for modes 1, 2, and 3, respectively.

5. SYNDES UNIT

5.01 The syndes unit is used in conjunction with LIU2 unit for mode 2 operation. The syndes unit and LIU2 furnish the functions provided by the M1C multiplexer used in 48 channel applications in existing systems; ie, it insures compatibility with the digital format required for T1C lines and that of two D4 digroups. This unit also adds synchronizing pulses to the data stream to synchronize digroup inputs. Unlike the other operational modes, digroup looping in mode 2 is performed in the syndes unit rather than in the associated line interface unit.

6. RECEIVE UNIT

6.01 The receive unit performs essentially the complementary functions of the transmit unit; that is, it decodes the PCM signal, demultiplexes the individual voice channel and extracts framing and per-channel signaling information.

7. OFFICE INTERFACE UNIT

7.01 In certain applications, such as when a D4 digroup connects to a No. 4 electronic switching system (ESS) office, or is used in the digital data system (DDS), an office interface unit (OIU1) is required to provide loop timing capability. In addition, the OIU1 provides an output to the T carrier administration and control system (TCAS) for remote alarm monitoring. This latter function is actually controlled by the alarm control unit.

8. ALARM CONTROL UNIT

8.01 The alarm control unit (ACU) monitors the D4 bank. Lights and switches on the faceplate of the unit are used for trouble indications and isolation. When a trouble condition develops, the ACU initiates signals to the trunk processing unit which affects trunk conditioning appropriate for the given situation. When the trouble clears, service is automatically restored. An alarm cutoff key is also provided to silence office alarms. One ACU (Mode 1) or two ACUs (Modes 2 & 3) are required for each D4 bank.

9. TRUNK PROCESSING UNIT

9.01 The trunk processing unit (TPU) provides trunk processing control signals to the channel units for specific trouble conditions as interpreted by the ACU, through the operation of relays under the control of the ACU.

9.02 Options are provided on the TPU to allow selection of the channel sequencing for each digroup in accordance with the particular terminal-to-terminal configuration involved (ie, D1D-, D2-, or D3-type banks) at the far end.

9.03 One other function performed in the TPU is the high-frequency-line-side cable equalizing function. Several types of plug-in cable equalizers are optionally provided depending on the cable distances and operational mode. (See Notes 110 and 225).

10. POWER DISTRIBUTION UNIT

10.01 The power distribution unit (PDU) accepts the -48 volt dc central office

battery and provides a fused power distribution arrangement for application of power to the D4 bank. Office alarms are activated by any fuse operation.

10.02 The PDU also provides filtering for the talk battery to reduce noise and ripple. In addition, the PDU furnishes fuse-protected 20-Hz ringing outputs.

11. POWER CONVERTER UNIT

11.01 The power converter circuit (PCU), which accepts a fused output from the PDU, converts the nominal -48 volt dc central office battery to regulated dc voltages of +5.0 volts, -12 volts, and +12 volts required for the operation of the D4 circuitry.

11.02 Light-emitting diodes are provided on the faceplate for alarm cutoff, fuse alarm, and converter fail status. An input on-off switch is provided which is equipped with a locking mechanism designed to insure that power is turned off when the unit is inserted or removed. Test points are provided to monitor output and input voltages.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 None.

2. FUNCTIONAL DESIGNATIONS

2.01 Terminal strip and connector designations are on the printed wiring board but the terminal strips not provided are not shown on the SD drawing.

3. FUNCTIONS

3.01 Provides for the translation of VF signals on 2-or-4-wire pairs to PCM signals suitable for transmission on T1 and T1C line facilities or, when connected to appropriate multiplexers, to higher rate digital facilities.

3.02 Provides supervisory and signaling information as required.

3.03 Provides for the conversion of -48 volt office battery to the regulated voltages required for the D4 bank operation.

3.04 Provides local, office, and remote alarms for system conditions which may impair or interrupt service.

3.05 Provides a "make-busy" condition for trunks associated with a failed bank.

4. CONNECTING CIRCUITS

4.01 48 Channel PCM Bank Type D4 Channel Unit 4-Wire Foreign Exchange Station End - SD-7C024-01

4.02 48 Channel PCM Bank Type D4 Channel Unit 4-Wire Foreign Exchange Office End - SD-7C025-01

4.03 48 Channel PCM Bank Type D4 Channel Unit 4-Wire Tandem Unit - SD-7C028-01

4.04 48 Channel PCM Bank Type D4 Channel Unit 4-Wire Transmission Only - SD-7C030-01

4.05 48 Channel PCM Bank Type D4 Channel Unit 2-Wire Transmission Only - SD-7C031-01

4.06 T1C Office Repeater Bay Application Schematic - SD-3C252-01

4.07 48 Channel PCM Banks Type D4 - D4 Maintenance Bank - Application Schematic - SD-3C290-01

4.08 Maintenance Bank Test Set - SD-3C291-01

4.09 Signaling Path Test Set - SD-3C294-01

4.10 Voltage Indicators and Simulators - SD-3C295-01

4.11 Extenders - SD-3C296-01

4.12 48 Channel PCM Bank Type D4 Line Interface Unit-1 - SD-3C300-01

4.13 48 Channel PCM Bank Type D4 Line Interface Unit 2 - SD-3C301-01

4.14 48 Channel PCM Bank Type D4 Line Interface Unit 3 - SD-3C302-01

4.15 48 Channel Bank Type D4 Syndes Unit - SD-3C303-01

4.16 48 Channel PCM Bank Type D4 Transmit Unit - SD-3C305-01

4.17 48 Channel PCM System Type D4 Receive Circuit - SD-3C306-01

4.18 48 Channel PCM Bank Type D4 Alarm Control Unit - SD-3C307-01

4.19 48 Channel PCM Bank Type D4 Office Interface Unit 1 - SD-3C308-01

4.20 48 Channel PCM Bank Type D4 Trunk Processing Unit - SD-3C311-01

4.21 48 Channel PCM Bank Type D4 Power Distribution Unit - SD-3C312-01

4.22 48 Channel PCM Bank Type D4 Dial Pulse Channel Unit Circuit Originating Office End - SD-3C322-01

4.23 48 Channel PCM Bank Type D4 Dial Pulse Channel Unit Circuit Terminating Office End - SD-3C323-01

4.24 48 Channel PCM Bank Type D4 4-Wire E & M Channel Unit - SD-3C324-01

4.25 48 Channel PCM Bank Type D4 Channel Unit Circuit Foreign Exchange Station-End - SD-3C325-01

4.26 48 Channel PCM Bank Type D4 Channel Unit Circuit Foreign Exchange Office End - SD-3C326-01

4.27 48 Channel PCM Bank Type D4 2-Wire E & M Channel Unit Circuit - SD-3C327-01

4.28 48 Channel PCM Bank Type D4 Channel Unit Sleeve Dial Pulse Originating - SD-3C330-01

4.29 48 Channel PCM Bank Type D4 Channel Unit Pulse Link Repeater - SD-3C331-01

4.30 48 Channel PCM Bank Type D4 Channel Unit 4-Wire E and M Extended Range - SD-3C332-01, -02

4.31 48 Channel PCM Bank Type D4 Channel Unit Dial Pulse/Multifrequency Originating Office End - SD-3C333-01,02

4.32 48 Channel PCM Bank Type D4 Channel Unit No. 2 ESS Direct Interface Originating End - SD-3C334-01

4.33 48 Channel PCM Bank Type D4 Channel Unit No. 2 ESS Direct Interface Terminating End - SD-3C335-01

4.34 48 Channel PCM Bank Type D4 Channel Unit 600 Ohm Extended Range 2WE&M - SD-3C337-01

4.35 Office Timing Supply - SD-73087-01

4.36 Power Systems DC Distribution Ckt for Digital Transmission System - SD-82046-01

4.37 Power Converter Unit - SD-82370-01

4.38 T-Carrier Administration System - SD-96607-01

4.39 T1 Carrier Application Schematic - SD-97080-01 and SD-97080-02

4.40 T1C Carrier Application Schematic - SD-99503-01

5. MANUFACTURING TESTING REQUIREMENTS

5.01 Continuity of all paths shall be verified. All components shall meet their own requirements.

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